

An Analysis of the Late Fall Mark-Recovery Data

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Previous Analysis in 2003

Variables

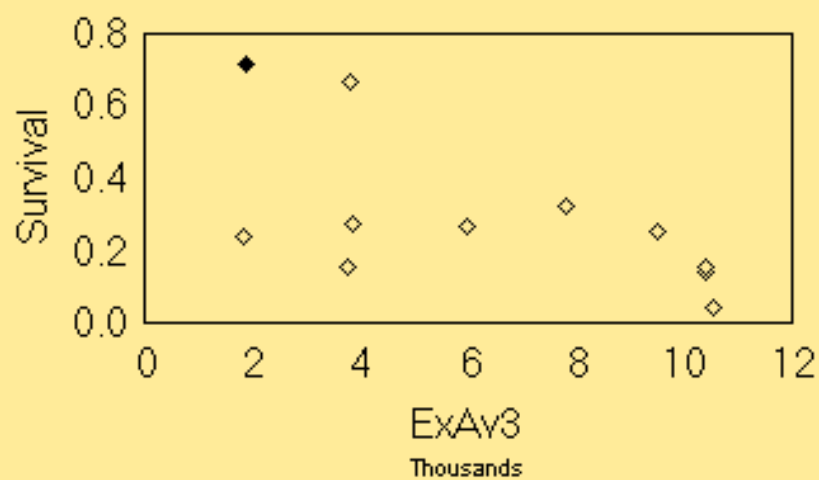
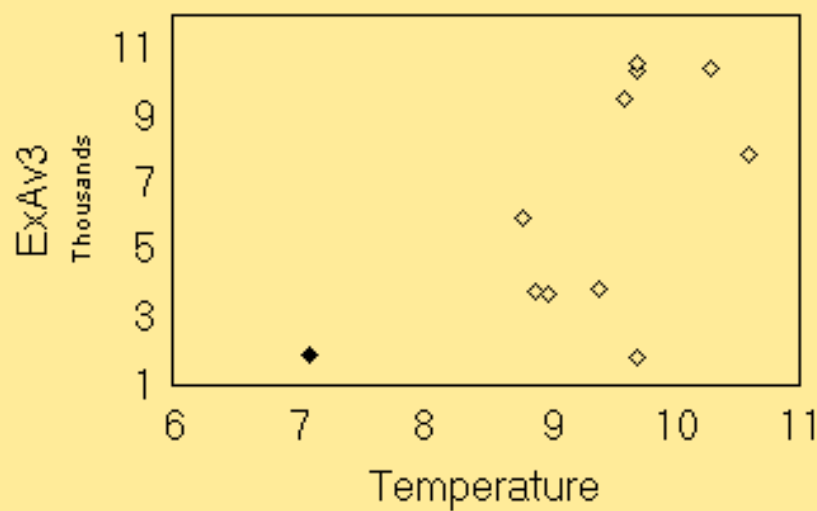
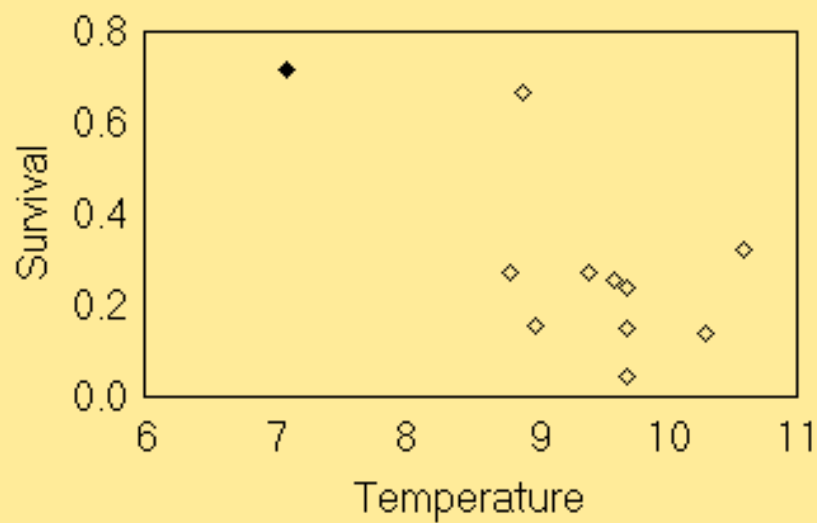
Surv	Estimated survival upstream to downstream from mark-recovery
Temp	Average water temperature during experiment
TempCh	Maximum temperature change per day during experiment.
ExAv3	Average exports in 3 days following release day, with similar definitions of ExAv5, ExAv7 and ExAv17.
ExAv3a	Average exports from CVP + Clifton Court inflows for 3 days following release day, with similar definitions for EzAv5a, ExAv7a and ExAv17a.
GSFAv3	Georgiana Slough flow average for 3 days following release, with similar definitions for GSFAv5, GSFAv7 and GSFAv17.
SFAv3	Sacramento River at Ryde flow average for 3 days after release, with similar definitions for SFAv5, SFAv7 and SFAv17.

Points to Note

- Survival is moderately negatively correlated with Temp ($r = -0.68$), ExAv3 ($r = -0.61$), and ExAv3a ($r = -0.57$).
- Highest correlation with flow variables is with 17 day averaging.
- Temperature is moderately positively correlated with the export variables.
- The export variables are all quite highly correlated.
- The flow variables are high to very highly correlated.
- For simplicity further analyses just considered Temp, TempCh, ExAv3 and SRAv17.

Regressions

- Simple regressions give a significant negative relationship between Surv and Temp ($p = 0.021$) and ExAv3 ($p = 0.048$), but quite insignificant results for TempCh and SRAv17.
- If ExAv3 is added to the equation with Temp already in then the improvement in fit is fairly minor (R^2 changes from 0.462 to 0.518). This is not at all significant ($F = 0.94$ with 1 and 8 df, $p = 0.361$).
- Apparently temperature is the important variable (but temperature is correlated with exports).
- But one data point seems to have a lot of influence.



Analysis with New Data

- Three new data points for December 2002, 2003 and 2004.
- Some changes in covariates.

Variables

Surv	Estimated survival upstream to downstream.
Tmp3	Average water temperature in 3 days following release at Rio Vista, with similar definitions for Tmp5, Tmp7 and Tmp9.
ExAv3	Average exports in 3 days following release day, with similar definitions of ExAv5, ExAv7 and ExAv17.
GSAv3	Georgiana Slough flow average for 3 days following release, with similar definitions for GSAv5, GSAv7 and GSAv17.
SFAv3	Sacramento River at Freeport flow average for 3 days after release, with similar definitions for SFAv5, SFAv7 and SFAv17.
RVAv3	Rio Vista flow average for 3 days after release, with similar definitions for RVAv5, RVAv7 and RVAv17.

Correlations

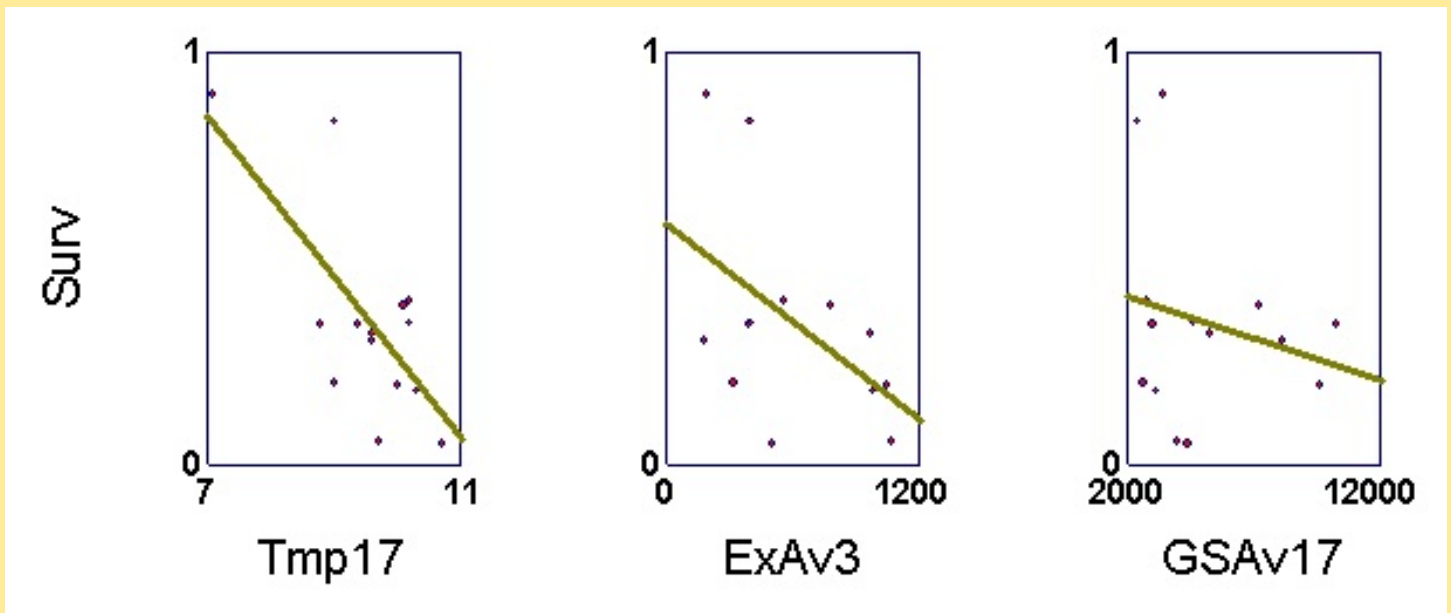
	Surv	Tmp3	Tmp5	Tmp7	Tmp17	ExAv3	ExAv5	ExAv7	ExAv17	GSAv3	GSAv5	GSAv7	GSAv17	SRAv3	SRAv5	SRAv7	SRAv17	RVAv3	RVAv5	RVAv7	RVAv17
Surv	1.00																				
Tmp3	<u>-0.60</u>	1.00																			
Tmp5	<u>-0.63</u>	<u>0.98</u>	1.00																		
Tmp7	<u>-0.69</u>	<u>0.92</u>	<u>0.97</u>	1.00																	
Tmp17	<u>-0.71</u>	<u>0.72</u>	<u>0.82</u>	<u>0.92</u>	1.00																
ExAv3	-0.50	0.18	0.24	0.40	0.45	1.00															
ExAv5	-0.44	0.17	0.22	0.38	0.43	<u>0.98</u>	1.00														
ExAv7	-0.40	0.23	0.28	0.44	0.49	<u>0.95</u>	<u>0.99</u>	1.00													
ExAv17	-0.33	0.27	0.34	0.51	<u>0.57</u>	<u>0.88</u>	<u>0.92</u>	<u>0.96</u>	1.00												
GSAv3	0.02	0.22	0.21	0.16	0.01	-0.18	-0.25	-0.24	-0.30	1.00											
GSAv5	-0.02	0.22	0.22	0.18	0.04	-0.15	-0.22	-0.21	-0.27	<u>0.99</u>	1.00										
GSAv7	-0.06	0.19	0.20	0.18	0.08	-0.08	-0.14	-0.13	-0.20	<u>0.96</u>	<u>0.98</u>	1.00									
GSAv17	-0.22	0.16	0.20	0.23	0.22	0.09	0.04	0.05	-0.05	<u>0.77</u>	<u>0.82</u>	<u>0.89</u>	1.00								
SRAv3	0.04	0.21	0.20	0.15	0.01	-0.18	-0.24	-0.24	-0.29	<u>1.00</u>	<u>0.99</u>	<u>0.95</u>	<u>0.74</u>	1.00							
SRAv5	0.00	0.21	0.22	0.17	0.05	-0.16	-0.22	-0.21	-0.27	<u>0.99</u>	<u>1.00</u>	<u>0.98</u>	<u>0.80</u>	<u>0.99</u>	1.00						
SRAv7	-0.05	0.17	0.19	0.17	0.09	-0.08	-0.14	-0.13	-0.20	<u>0.97</u>	<u>0.98</u>	<u>1.00</u>	<u>0.88</u>	<u>0.96</u>	<u>0.98</u>	1.00					
SRAv17	-0.22	0.15	0.19	0.22	0.23	0.09	0.05	0.06	-0.04	<u>0.76</u>	<u>0.81</u>	<u>0.89</u>	<u>1.00</u>	<u>0.74</u>	<u>0.80</u>	<u>0.88</u>	1.00				
RVAv3	0.01	0.22	0.24	0.21	0.08	-0.10	-0.19	-0.18	-0.20	<u>0.98</u>	<u>0.97</u>	<u>0.94</u>	<u>0.73</u>	<u>0.98</u>	<u>0.98</u>	<u>0.94</u>	<u>0.72</u>	1.00			
RVAv5	-0.02	0.19	0.21	0.19	0.08	-0.09	-0.16	-0.16	-0.20	<u>0.99</u>	<u>0.99</u>	<u>0.97</u>	<u>0.80</u>	<u>0.98</u>	<u>0.99</u>	<u>0.97</u>	<u>0.80</u>	<u>0.99</u>	1.00		
RVAv7	-0.08	0.10	0.13	0.16	0.12	0.01	-0.05	-0.04	-0.11	<u>0.92</u>	<u>0.95</u>	<u>0.98</u>	<u>0.91</u>	<u>0.91</u>	<u>0.94</u>	<u>0.98</u>	<u>0.91</u>	<u>0.92</u>	<u>0.96</u>	1.00	
RVAv17	-0.22	-0.04	0.02	0.12	0.21	0.24	0.21	0.20	0.12	<u>0.59</u>	<u>0.65</u>	<u>0.76</u>	<u>0.94</u>	<u>0.56</u>	<u>0.63</u>	<u>0.75</u>	<u>0.94</u>	<u>0.57</u>	<u>0.66</u>	<u>0.84</u>	1.00

Points to Note

- Survival is negatively correlated with the temperature variables, with Tmp17 having the most significant correlation ($r = -0.71$, $p = 0.004$).
- Survival is negatively correlated with exports, with ExAv3 having the most significant correlation ($r = -0.50$, $p = 0.069$).
- Survival is not very correlated with the flow variables, but the most correlation is with the GSAv17, SRAv17 and RVAv17 (for all, $r = -0.22$, $p \approx 0.45$).
- Tmp17 and ExAv17 are significantly correlated for some reason ($r = 0.57$, $p = 0.035$).
- The temperature variables are highly correlated.
- The export variables are highly correlated.
- The flow variables are highly correlated.

Further Analysis

- For simplicity choose one temperature variable, one export variable, and one flow variable (Tmp17, ExAv3, GSAv17, the ones with most correlation with survival).



- Note the importance of the two high survival rates.

Regression Equations

Parameter	Estimate	SE	P-Value
All Variables $R^2 = 42\%$			
Constant	1.646	0.466	
Tmp17	-0.132	0.053	0.033
ExAv3	-1.40×10^{-5}	1.49×10^{-5}	0.368
GSAv17	-5.30×10^{-6}	16.10×10^{-6}	0.751
Dropping GSAv17 ($R^2 = 47\%$)			
Constant	1.653	0.446	
Tmp17	-0.135	0.050	0.020
ExAv3	-1.40×10^{-5}	1.43×10^{-5}	0.349
Dropping ExAv3 ($R^2 = 47\%$)			
Constant	1.780	0.426	
Tmp17	-0.157	0.044	0.004

Conclusion

- The extra three data points have not changed the results substantially from what they were in 2003.
- The water average water temperature over 17 days accounts for the variation in survival better than exports or flow rates.
- But the two high survival rates are crucial to this conclusion. Without these two points nothing is at all significant.